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Promotional policy for renewable energy development in Taiwan

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ABSTRACT

On June 12, 2009, Taiwan government approved a bill of "Statute for Renewable Energy Development", which aimed at promoting the use of renewable energy, boosting energy diversification, and helping reduce greenhouse gases. The new act caps the subsidies for renewable energy up to 10 GW within 20 years. It authorizes the government to enhance incentives for the development of renewable energy via a variety of methods, including the acquisition mechanisms, incentives for demonstration projects, and the loosening of regulatory restrictions. According to the subsidies of the Statute, the share of power capacity of renewable energies will be triple of the nationwide power installation capacity by 2029. The purpose of this paper is to present an updated overview of promotional policy of renewable energy in Taiwan, in addition to evaluate the growth space of individual renewable energies in the post-Statute era by considering the technology development, domestic conditions, and indigenous industries related to renewable energy.

Contents

1. Introduction

Renewable energies are sustainable and clean energies, which are regarded as the potential candidates that can overcome the problems of the gradual depletion of fossil fuels as well as the global worming caused by the greenhouse gas emission [1,2]. Therefore, the development of renewable energy has received great attention, and the application of renewable energy has been accelerated in the pass few years [3,4].

Essentially, renewable energies are exploited from nature, indigenous, and theoretically inexhaustible; however some drawbacks do exist in the application of renewable energies, such as unstable supply and high cost. Therefore, when applying renewable energy, local conditions such as solar radiation and wind

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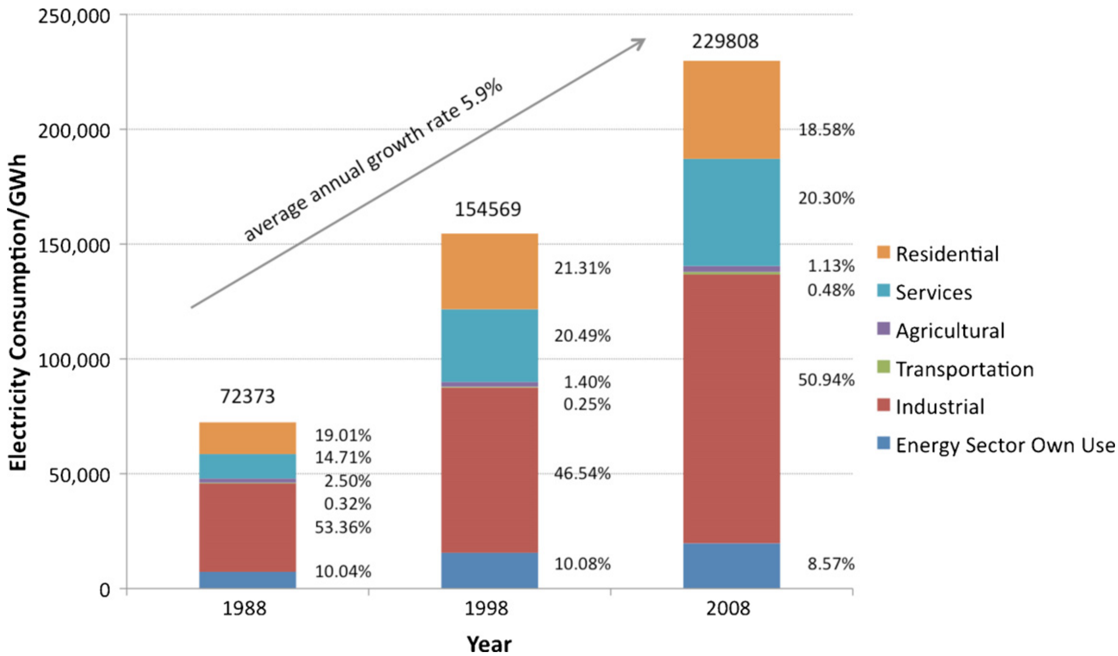


Fig. 1. Taiwan's electricity consumption in the past two decades.

power potentials, and site situation should be assessed carefully before installing renewable energy systems [5,6]. In addition, under the conditions of insufficiently economic impetus at the present stage, the development of renewable energy still relies on the governmental incentive or subsidizing schemes. In the past decade, a lot of promotion policies regarding to renewable energy development policy have been adopted in many countries [7,8].

In Taiwan, to effectively remove the above promoting barriers, the government has approved "Statute for Renewable Energy Development" on June 2009 through the 6-year endeavors. According to the Statute, the nationwide power capacity of renewable energy increases up to 10 GW in the next 20 years. By actively implementing this act it is hoped to achieve the so-called triple-win goal, i.e., reduction in greenhouse gas emission, improvement in energy diversity, and promotion in green-energy industries. The objective of this paper is to present an updated overview of the progress of renewable-energy policy in pre-Statute period in Taiwan, in addition to evaluate the development space of individual renewable energies in the post-Statute era by considering the technology development, domestic conditions, and indigenous industries related to renewable energy.

2. Status of renewable energy development

2.1. Status of power generation

High electricity demands followed the rapid economical progress in Taiwan during the last two decades. As shown in Fig. 1, the electricity consumption in 2008 is 229,808 GWh, which is more than triple of that in 1988 (72,373 GWh) [9]. Accordingly, the average annual growth rate of electricity consumption is 5.9% in the last two decades. In the meantime, as shown in Fig. 2, the installed capacity of power generation increases from 16,788 MW in 1988 to 46,382 MW in 2008, which results in 5.2% average

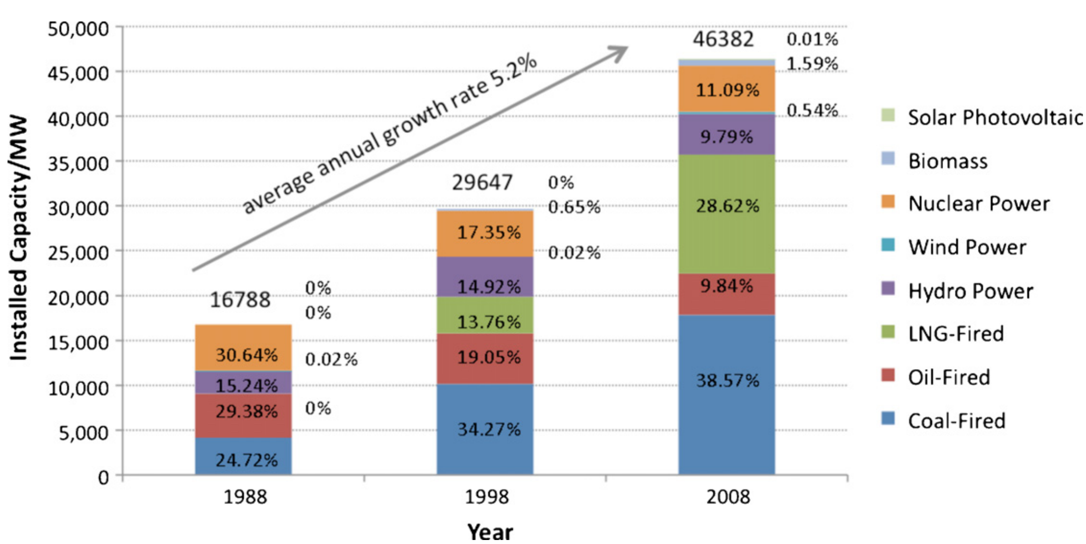


Fig. 2. Generation capacities in the past two decades in Taiwan.

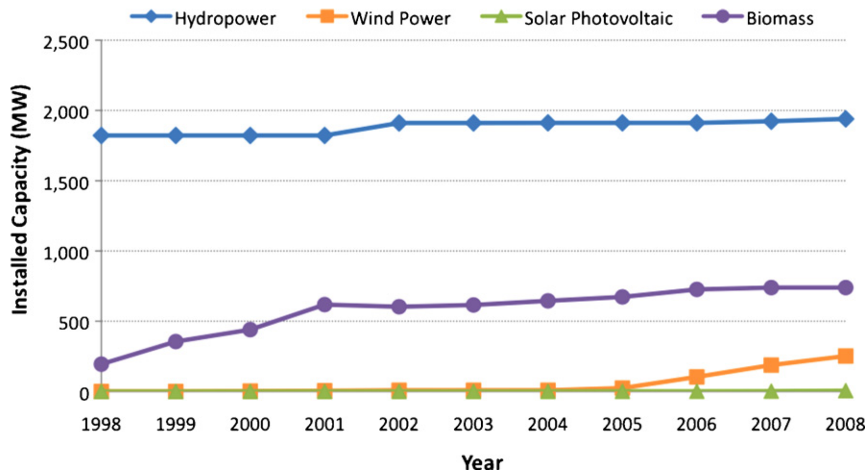


Fig. 3. Variation of installed capacity of renewable energy in Taiwan.

Table 1
Current status (2008) of installed capacity of renewable energy in Taiwan.

Renewables	Installed capacity (MW)	Share of total (%)
Hydropower	1937.9	4.17%
Wind power	252[a]	0.54%
Solar photovoltaic	5.6[b]	0.01%
Geothermal	0	0
Biomass	739.3	1.59%
Total capacity[c]/share of total	2934.8	6.32%

[a] Including 6.1 MW non-feed-in capacity.
[b] Non-feed-in capacity.
[c] Total installed capacity of power generation in 2008 is 46,381.6 MW.

annual growth rate of total installed power capacity of in the past two decades. It is noted that, except for the conventional hydropower, the power generation from the renewable energy is nearly negligible in the power structure of Taiwan before 1998. It is reasonable because the government began implementing measures for subsidizing the installation of renewable energy apparatus since 2000. Before that, most renewable energy power facilities installed in Taiwan were just for research, educational, and/or demonstration purposes.

Fig. 3 further shows the development of the installed capacity of four kinds of renewable energy from 1998 to 2008, i.e., hydropower, wind power, solar photovoltaic and biomass, respectively [9]. It is seen that the installed capacity of the four kinds of renewable energy are gradually increased. The installed capacity for biomass power plant increases since 1998, while that for the wind power increases after 2005. Table 1 further summarizes the status of the installed capacities of renewable energy in 2008, which shows 1938 MW for hydropower generation, 252 MW for wind-power generation, 5.4 MW for solar photovoltaic system, and 739 MW for biomass power generation. The aforementioned data summation is 2934 MW, share of which is 6.32% of the nationwide power capacity by 2008. The development of individual renewable energies along with the promotion plans from 2000 to 2008 in Taiwan is drawn below.

2.2. Solar photovoltaic

Taiwan locates in the subtropical area and possesses excellent solar irradiation for photovoltaic applications. In order to encourage the use of renewable energy, the government promulgated the "Measures for Subsidizing Solar Photovoltaic Systems" since 2000. These promotional schemes receive a good response of sharp increases of the installed capacity and power generation from 2000, as shown in Fig. 4. The total installed capacity is 5.6 MW by the end of 2008 [9], which comprises majorly emergency and disaster prevention systems in remote areas and offshore islands and the demonstration PV systems installed on public buildings such as the Presidential Building, and Legislation Yuan, etc. In addition, the solar photovoltaic systems are also widely installed in schools for educational purposes. Recently, the government

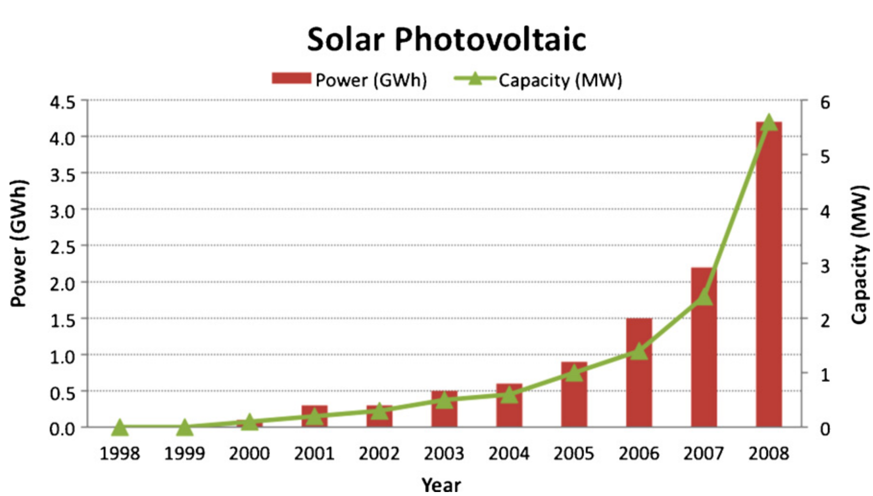


Fig. 4. Variation of installed capacity and power generation of solar photovoltaic in Taiwan.

Table 2
Recent promotion projects of the installation of solar PV systems.

Promotion projects	Project contents
Solar Community Project (2007–)	PV systems for residential houses in special community designated by local governments. 2 MW will be installed by 2009. The total installation capacity will be up to 4 MW
Solar Top Project (2007–2010)	PV systems integrated with landmark buildings, designed by local governments
Solar Campus Project (2008–)	PV systems installed in junior high schools and elementary schools for educational purposes
Public Building Installation Project (2009–)	Construction projects of public buildings with budgets over NT$ 50 million must install PV systems with at least 5% expense of the total budget for PV

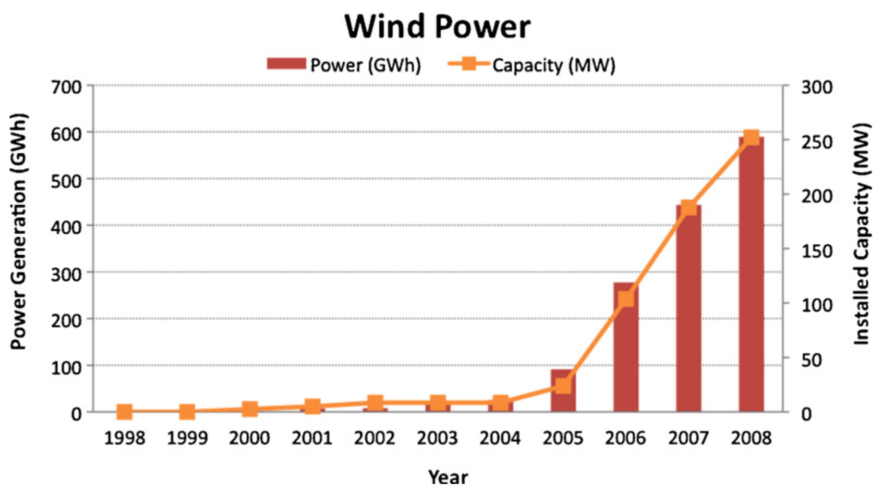


Fig. 5. Variation of installed capacity and power generation of wind power in Taiwan.

continues to promote the installation of solar PV systems through several projects, as shown in Table 2, such as ''Solar Top Project'' for demonstration PV systems on landmark buildings, ''Solar Community Project'' for integration of PV with residential construction to form a solar community, and ''Solar Campus Project'' for installation of PV systems in junior high schools and elementary schools for educational purposes. Note that all of the projects are for demonstration and/or educational purposes. The commercial solar PV plants are not available yet in Taiwan. It is believed that the installed capacity of solar photovoltaic systems will boost by the ''Renewable Energy Development Bill'' for commercial applications.

2.3. Wind power

Wind power is relatively mature among the various renewable-energy technologies and is regarded as the major renewable energy in the near term. With abundant wind resources along the west coast and on offshore island, Taiwan has superior advantages in geographic location to develop wind energy. The government started to promote the installation of large-scale wind turbines since 2000. As shown in Fig. 5, the installed capacity of wind power boosts from 2005, and a total of 141 wind turbines have been installed onshore by 2008, with the installed capacity of 252 MW [9]. Additional 14 sets of wind turbines were further completed in the last half-year. Consequently, Taiwan has completed 155 sets of wind turbines with total capacity of 281.6 MW now. As shown in Table 3, Taiwan Power Company (TPC), the governmental monopolized utility company, built the most of wind turbines; the remainders is constructed by private sectors. Assuming that 1 kW of the installed capacity averagely produces 2700 kWh per year, the wind power now can totally generate 760 million kWh annually, supporting the electricity demand about 190 thousand households (a family of 4). In addition to the onshore wind farms, the government is currently planning for promoting offshore wind

Table 3
Completed wind farms in Taiwan by July 2009.

Wind farm	Developer	Number of wind turbines	Capacity (MW)
Penghu Jhongtun 1st + 2nd phases	Taiwan Power Company	8	4.8
Shihmen (1st NPP)	Taiwan Power Company	6	3.96
Hengchun (3rd NPP)	Taiwan Power Company	3	4.5
Taoyuan Datan	Taiwan Power Company	3	4.5
Taoyuan Dayuan Guanyin	Taiwan Power Company	20	30
Taichung Power Plant	Taiwan Power Company	4	8
Taichung Harbor	Taiwan Power Company	18	36
Changbin Industrial Park	Taiwan Power Company	23	46
Hsinchu Siangshan	Taiwan Power Company	6	12
Yunlin Mailiao	Formosa Heavy Industries Corp.	4	2.64
Hsinchu Chunfong	Cheng Loong Corp.	2	3.5
Miaoli Jhunan	InfraVest GmbH	4	7.8
Miaoli Dapeng	InfraVest GmbH	21	42
Changbin Lugan	Luway	33	75.9
Total	–	155	281.6

farms to utilize the abundant wind resources in Taiwan Strait [10]. It targets on developing 300 MW of offshore wind power in the first stage, which symbols a milestone of wind-power development in Taiwan.

2.4. Geothermal energy

Taiwan is located at the western edge of Pacific volcano belt. There are more than a hundred hot springs with energetic geothermal activities. Taiwan started exploration of geothermal resources since 1976, and successfully completed the first geothermal power plant, Chingshui geothermal power plant, in 1981. The installed capacity of Chingshui geothermal power generation is 3 MW. By 1993, the pilot power plant was halted because declination of the output of power generation to unacceptable levels. Possible reasons for failure are the special characteristics of Chingshui geothermal pools not being adequately understood as the time; hence the irrelevant power generator was used and inappropriate operation causing severe scaling of the pipelines. Now, it is serving as a demonstration park for utilization of geothermal energy for recreation and tourism.

Although, the economic incentives are sufficient after approving the "Renewable Energy Development Bill", several limitations for promoting geothermal power generation in Taiwan should be carefully considered:

- No proper sites: most geothermal sites are located at remote forest areas (managed by the Forest Agency, Council of Agriculture), original resident reservation areas or National Parks. Therefore, it is hard to get land development permits as far as environmental-impact concerns.
- Lack of data resources: it is not easy to develop the geothermal energy without sufficient data about geothermal resources. Actually, there is a lack of evaluation, review, development and supervision procedures about the application of geothermal energy.
- Cost in grid-connection: grid-connection cost with the TPC network is quite high.

2.5. Hydropower

Hydropower is one of the most traditional renewable energies in Taiwan. Since the first hydropower plant was built in 1905, the utilizations of hydropower have been over a hundred years in Taiwan. Fig. 6 shows the variation of installed capacity and electricity contribution of the hydropower from 1998 to 2008. At the end of 2008, the total installed capacity of hydropower plants is 1937.9 MW, which contributed 4305.1 GWh electricity in 2008 [9]. As further shown in Fig. 6, the electricity contribution of hydropower drops significantly from 7148 GWh in 1998 to 5482 GWh in 1999 due to the aftermath by the September 21 Earthquake. Another drop in the power generation between 2001 and 2002 is due to the serve damages of hydropower facilities by Nari typhoon in 2001. Actually, the power generation from hydropower keeps in low levels over years and has not recovered yet up to the present time.

According to the governmental report [11], the potential of feasible hydropower including 30 important rivers is 5000 MW in Taiwan. However, as far as the environmental-impact concerns, new hydropower projects focus on small gen-sets (less than 20 MW) instead of large-scale hydropower plants that involve in constructing large dams. Therefore, the rate of growth in the installed capacity of hydropower is not expected to be high in the near future.

2.6. Biomass power

As shown in Fig. 7, the installed capacity of the biomass plants and the corresponding power generation in the past decade. At the end of 2008, the total installed capacity of biomass power plants is around 739.3 MW, which contributed electrical power over 3400 GWh in 2008 [9]. The major feedstocks of the biomass plants are municipal solid wastes (MSW) and biogases. In the former case, there are 24 MSW incinerators equipped with power generators around the island, and the total installed capacity is 622.5 MW. The biogas utilizing in power generators is generated from 4 large landfills and a lot of pig farms. While, there are also some power plants using industrial and agricultural wastes, including baggies, paper mill waste, plastic waste, rubber waste, rice hull and RDF-5, etc. The total capacity of these plants is around 116.8 MW.

2.7. Renewable thermal energy

In addition to the power sector, Taiwan is currently devoted to the development the renewable thermal energy, including the solar water heater for the residential sector and biofuels for in transportation sector.

For solar water heater systems, Taiwan implemented the "Measures for Promoting Solar Water Heater Systems" since 2000. The nationwide installed area of solar heat collectors has reached 1.77 million m^2 (about 435 thousand households) at the end of 2008, which is the 11th largest utilization country in the world. The installation density based on the land area ranks as the third in the world. There was an annual saving of about 111,000 kl oil

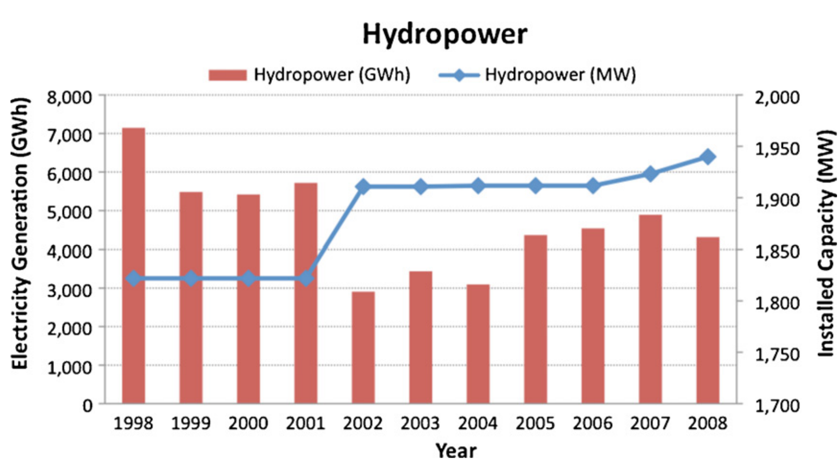


Fig. 6. Variation of installed capacity and power generation of hydropower in Taiwan.

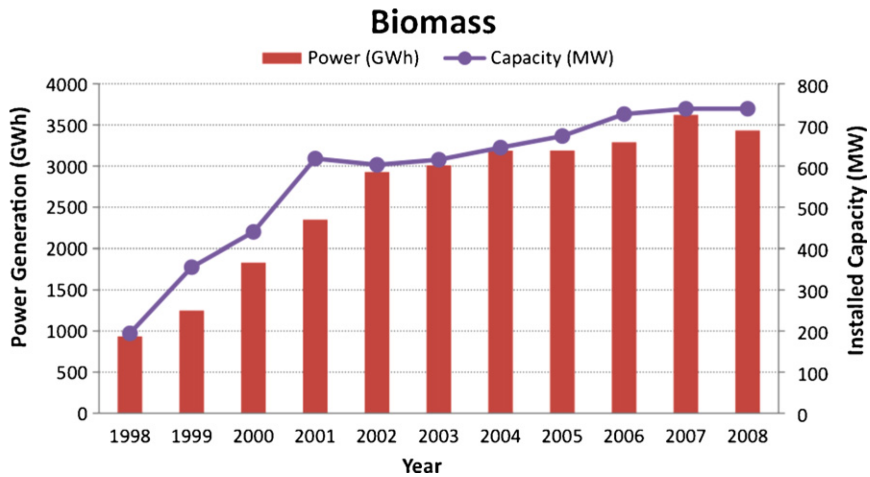


Fig. 7. Variation of installed capacity and power generation of wind power in Taiwan.

Table 4
Pre-Statute interim incentives for renewable energies in Taiwan.

Type	Incentives	
Solar Photovoltaic	Demonstration Programme Subsidy: NT$ 150,000/kW limitation of 50% of installation cost maximum	
Solar Thermal	Subsidy for Main Island: 1. Plate type heat accumulator with cover: NT$ 2250/m^2 2. Vacuum type heat accumulator: NT$ 2250/m^2 3. Plate type heat accumulator without cover: NT$ 1500/m^2 Subsidy for Offshore Island: 1. Plate type heat accumulator with cover: NT$ 4500/m^2 2. Vacuum type heat accumulator: NT$ 4500/m^2 3. Plate type heat accumulator without cover: NT$ 3750/m^2	
Geothermal	Exploration Subsidy: 50% of Exploration Cost Maximum	
Electricity Purchase Programme	Renewable Energy Purchase Scheme (TPC)	1. Purchase price is NT$ 2/kWh and guarantee for 15 years 2. Total purchase capacity will be 600 MW
	Incentive Measures for Biogas Power Generation in General Waste Landfill Field	1. Add to purchase price is NT$ 0.5/kWh 2. The approved purchase capacity has reached 24.5 MW
Tax Incentives	Statute for Upgrading Industries	1. Business entities investing in new and clean energy can enjoy a tax credit up to 11% of the equipment cost
	Business Entities Purchasing Energy Saving Equipment or Using New Energy Equipment of Technology Tax Credits	2. Investments in new and clean energy industry can enjoy income tax credits, ranging from 10% to 20% of the investments 3. Two-year accelerated depreciation 4. Low interest loans: up to the 2-year postal saving floating interest rate, plus 2.45%
	Customs Duty	Duty exemption for imported equipment without domestic manufacturer

equivalent (KLOE) of conventional fossil energy, corresponding to 4.13 million barrels of 20 kg domestic LPG.

To promote the biofuels (biodiesel and bioethanol) in the transportation applications, several programs have been carried out in the past few years such as the "Energy Crop Green Bus Program" and "Green County Demo Program". Regarding the Energy Crop Green Bus Program, a total of 507 public buses are fueled biodiesel, including 428 in Kaohsiung City and 79 in Chiayi County. At present, Kaohsiung and Chiayi are respectively the second and third cities where all public buses use biodiesel, while Kyoto, in Japan is the first in the Asia region. The Green County Demo Program was launched in July 2007, providing B1 biodiesel (1% biodiesel blended with diesel) in the gas stations of Taoyuan County, Chiayi County, and Chiayi City to the public, with an estimated consumption amount of 6500 kl. In addition, governmental vehicles in Taipei municipal have been mandated to use E3 (3% bioethanol blended with gasoline) available at eight gas stations in Taipei since September 2007 under the Government Vehicles Demo Program.

Table 4 summarized the pre-Statute interim incentives for renewable energies in Taiwan.

3. The Statute

3.1. Renewable-energy targets

Table 5 shows the target transition of renewable energy development in Taiwan. In response to the Kyoto Protocol adopted in December 1997, the government convened the First National Energy Conference in 1998. One of the most important conclusions was to increase the share of renewable energy in nationwide total energy supply, i.e., up to 3% by the year of 2020. During the period of 2000–2008, several national conferences were held for discussing and thus revising the target of the renewable energy development, such as the Sixth National Science and Technology Conference (2001), the National Nuclear-Free Homeland Conference (2003), the Second National Energy Conference (2005), the National Conference on Sustainable Development (2006), etc. According to the conclusions of these conferences, an aggressive near-term target was proposed, i.e., 10% of total installed electrical power generation capacity to be delivered from renewable energy by 2010. That is the total installed renewable power should be 5000 MW. However, as shown in Tables 1 and 5, current utilization

Table 5
Transition of renewable-energy target in Taiwan.

Year	Policy decision	Target
1998	1st National Energy Conference	Renewable energy share in the energy supply is 3% by 2020
2005	2nd National Energy Conference[a]	Near term: 10% of total power capacity by 2010[a] (about 5000 MW) Long term: 12% of total power capacity by 2025 (about 8000–9000 MW)
2008	Framework of Taiwan's Sustainable Energy Policy	Renewable energy share in the electricity system (capacity) reaches 8% by 2025
2009	Statute of Renewable Energy Development	Subsidies for renewable energy generation capacity by 6500–10,000 MW within 20 years

[a] Also proposed by the conferences of 6th National Science and Technology Conference, 20th Science and Technology Advising Conference, and Nuclear-Free Homeland National Conference.

(2008) of renewable energy is only 2935 MW, which is far below the target of 5000 MW. Considering the growth rate of installed capacity of renewable energy in the last few years, it is considerably pessimistic to reach this target of 10% of renewable-energy by 2010 in the total power capacity. In 2008, another revised target is further proposed in "Framework of Taiwan's Sustainable Energy Policy", i.e., the renewable-energy share in the electricity system (capacity) reaches 8% by 2025. It is relatively conservative as compared to those proposed in 1998 and 2005.

As summarized in Table 5, the government has proposed various targets for renewable energy development in the past decade. However, these targets are not consistent at all, not only in the baseline year for calculation but also in the renewable-energy target (share) in the power system. The major reason is that the national energy structure cannot reach consensus between the governing party (KMT) and the opposition party (DPP) due to the distinction in the nuclear-power policy [12]. Nevertheless, the renewable-energy targets, either aggressive or conservative, cannot realize without strong supports by sound laws as well as effective measures. Accordingly, the government has passed the "Statute for Renewable Energy Development" recently, which authorizes the government to enhance incentives for the development of renewable energy via a variety of schemes. It is believed the passage of the Statute represents that the development of renewable energy has reached a new milestone in Taiwan.

3.2. About the Statute

The "Statute for Renewable Energy Development" aimed at promoting the use of renewable energy, boosting energy diversification, and helping reduce greenhouse gases. It gives incentives to the development of green-energy industries, including solar energy, ocean energy, wind power, biofuel, geothermal energy, non-pump and storage hydropower, and renewable hydrogen power. The goal is to increase nationwide renewable energy generation capacity by 6500–10,000 MW within 20 years. The essence of the Statute is providing fixed feed-in tariffs and grid-connecting obligation to secure the market for electricity generated from renewable energy. Its backbone is to create a favorable developmental environment to achieve the scheduled targets. The Statute authorizes the government to enhance incentives for the development of renewable energy via a variety of methods, including the acquisition mechanisms, funding sources, incentives for demonstration projects, and the loosening of regulatory restrictions. Important features and strategies embedded in the Statute are summarized in Table 6 and are drawn below.

Acquisition mechanisms. The renewable energy acquisition mechanism in the Statute involves the government's provision of a reasonable profit for those who install renewable energy generating equipment, along with a requirement for the operator of the electricity grid to provide parallel connections for such generators and for the wholesale of electricity from them. The purchase price and its method of calculation will be determined by a committee organized by the government, which comprises related ministries and commissions, scholars, experts, and other pertinent groups. The price will be reviewed and adjusted annually. It is noteworthy that the TPC had issued interim measures for purchasing electricity from renewable energy sources since 2003. The fixed feed-in tariff for wind-power generation is NT$ 2/kWh (about EUR 0.05/kWh) [13], which is much cheaper than that in the average level of EU [14]. It is

Table 6
Summary of the Statute for Renewable Energy Development.

Item	Contents
Promotional Target (Subsidy Cap)	Subsidies for renewable energy generation capacity by 6500–10,000 MW within 20 years
Renewable-Energy Categories	Solar energy, ocean energy, wind power, biofuel, geothermal energy, non-pump and storage hydropower, and renewable hydrogen power
Acquisition Mechanisms	Fixed feed-in tariffs and grid-connecting obligation The purchase price and its method of calculation is determined by a committee comprising related ministries and commissions, scholars, experts, and other pertinent groups The price will be reviewed and adjusted annually
Funding Sources	The funding for extra cost of purchasing the renewable energy to the electricity tariff is from electric power consumers The government would interfere with the budget of the founding if necessary Subsidies for the use of renewable thermal energy such as solar thermal energy, biofuel, etc. is provided from the Petroleum Fund and Agricultural Development Fund
Loosening of Regulatory Restrictions	Renewable energy generating facilities are allowed to apply electricity industry regulations regarding acquirement of land-use rights, usage procedures, and disposition Land needed for renewable energy generating plants may be acquired under the qualification of a public utility as provided in the Urban Planning Law, the Forestry Act, and the Fisheries Act Procedures for the acquisition of necessary licenses will be simplified
Incentives for Demonstration Projects	Subsidies for demonstration of renewable energy equipment that has good potential and employs technology in the early stages of development.

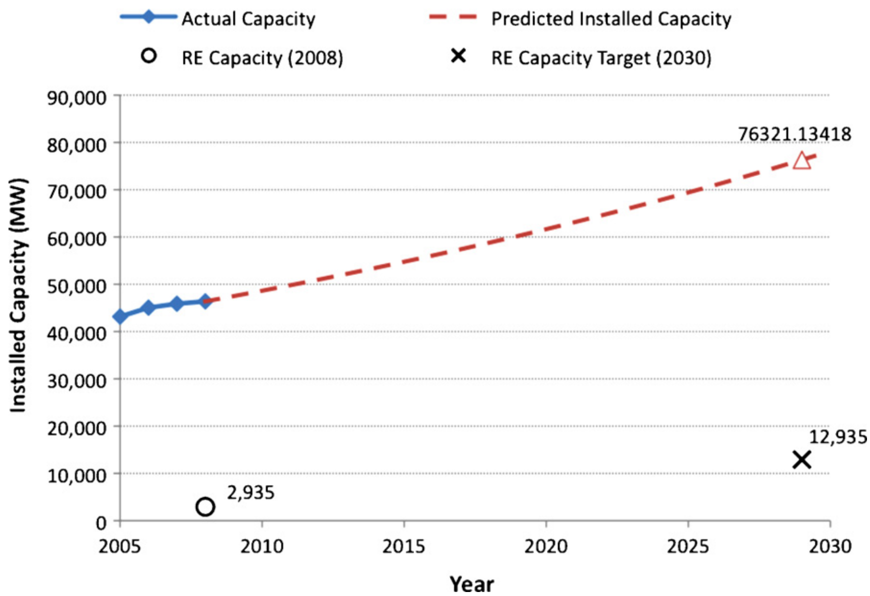


Fig. 8. Target of the installed capacity of renewable energy.

noteworthy that TPC is buying electricity from private power producers using gas-fired generators for NT$ 4.7/kWh and NT$ 2.3/kWh for those using coals, respectively. The unreasonable fixed feed-in tariffs between the fossil-fuel-based electrification and renewable-energy-based electrification is hindering the deployment of the renewable energy in Taiwan, and it is arguing nationwide continuously. Actually, the purpose of this Statute is to provide a reasonable electricity purchase price that encourages private sectors to install renewable energy generating equipments. According to the preliminary estimation [15], the fixed feed-in tariff for wind-power generation will be increased to NT$ 2.2–5.3/kWh.

Funding sources. For the differences between non-renewable electricity generating costs of power utilities and renewable electricity feed-in tariffs, a fund will be established to subsidize utilities when they produce or purchase renewable electricity. Therefore, the so-called "The Renewable Energy Development Foundation" will be set under the bill to support the research, development and promotion of renewable energy and its relevant techniques and equipments. The funding sources are from Taiwan Power Company. If necessary, the government would interfere with the budget of the foundation. Note that if Taiwan Power Company shifts the extra cost of purchasing the renewable energy to the electricity tariff, consequently, each electric power consumer in Taiwan has to pay more than before in average.

Loosening of regulatory restrictions. In the area of deregulation, according to the Statute, renewable energy generating facilities that reach a certain capacity are allowed to apply electricity industry regulations regarding acquirement of land-use rights, usage procedures, and disposition. In addition, land needed for renewable energy generating plants may be acquired under the qualification of a public utility as provided in the Urban Planning Law, the Forestry Act, and the Fisheries Act. Moreover, procedures for the acquisition of necessary licenses will be simplified.

Incentives for demonstration projects. At the present time, some renewable energy technologies for power generation are still more expensive than other forms of renewable energy, such as solar PV, and hydrogen fuel cells. In consideration of the impact of their development potential on future electricity prices, the government will, for a certain period, provide a subsidy for the procurement of renewable energy generating equipment that has good potential and employs technology in the initial stages of development. Promotion will be carried out in stages so that the increase in demonstration projects will expand domestic market demand and encourage the development of related green industries.

Table 7
Current status and targets of renewable energy for the Statute in Taiwan.

Year	2008	2029 (Target Cap)	Annual Growth rate[a]
Total capacity (MW)	46,382	76,321	2.4%
RE installed capacity (MW)	2,935	12,935	7.8%
Share of total capacity	6.32%	17.0%[**]	–

[**] All subsidies providing for new installed capacities.
[a] Average annual growth rate by installed capacity was 5.2% from 1998 to 2008, and is assumed to be 2.4% from 2009 to 2029.

Exploitation of thermal energy. Subsidies for the use of solar thermal energy, biofuel, and other kinds of renewable thermal energy will be provided from the Petroleum Fund and Agricultural Development Fund.

3.3. Target based on the Statute

In the Statute, the subsidized renewable-energy power capacity is capped 10,000 MW. It is interesting to know what is the share of the renewable-energy capacity after fulfilling this Bill. If all subsidies of the Bill are applied to new installation of renewable energy facilities, the installed capacity of renewable energy can reach 12,935 MW by 2029, with the annual growth rate of 7.8%. As shown in Fig. 8, the predicted averaged annual growth rate of the total capacity (dashed line) is 2.4% in the next 15 years according to the governmental report [16]. Therefore, the total installed power capacity in 2029 will be 74,589 MW. Therefore, as shown in Table 7, the share of installed capacity of renewable energy will increase from 6.32% to 17% after carrying out the Bill. This target is not far from the targets of 20 by 20 those were proposed by many developed countries, such as Australia, EU, etc.

4. Conclusion

After approving the "Statute for Renewable Energy Development", Taiwan government has made a clear and strong commitment to develop renewable energy. According to the Statute, the

government will enhance incentives for the development of renewable energy via a variety of methods, including the acquisition mechanisms, incentives for demonstration projects, and the loosening of regulatory restrictions. Significant growth in new and renewable energy utilization can be expected. The main conclusions from the above reviews are as follow:

(1) Wind power is a relatively mature technology that will play a major role in the application of renewable energy in the near term.
(2) Solar photovoltaic products are booming in current energy market worldwide. Concurrently, the installed capacity of the solar PV plants in Taiwan will be boost when the fixed feed-in tariffs are ready to go. In addition, strengthening R&D capability and developing advanced PV technology for enhancing the efficiency as well as reducing the cost with be the next promotional strategies in Taiwan.
(3) The share of renewable energy in total power capacity in Taiwan is projected to increase from 6.32% in 2008 to 17% in 2029.
(4) The government continues to promote other potential renewable energies such as advanced PV system, biofuel and hydrogen and fuel cell to utilize renewable resources in all aspects.

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